



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,565	12/30/2003	Bryan M. White	884.864US1	8030
21186 7590 04/30/2008 SCHWEGMAN, LUNDBERG & WOESSNER, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402				
EXAMINER				
IM, JUNGHWAM				
ART UNIT		PAPER NUMBER		
2811				
MAIL DATE		DELIVERY MODE		
04/30/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/748,565

Applicant(s)

WHITE ET AL.

Examiner

JUNGHWAN M. IM

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-11 and 17-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 22-25 is/are allowed.
- 6) ☐ Claim(s) 7-11 and 17-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB06) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7-11 and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dangelo et al (US 7109581), hereinafter Dangelo in view of Uang et al. (US 6989325), hereinafter Uang and Brown et al. (US 6340822), hereinafter Brown.

Regarding claims 7, 11 and 17, Fig. 4 of Dangelo shows an integrated circuit package, comprising:

a die/IC 402;

a heat sink 404, and

a thermal intermediate portion 408 comprising a plurality of carbon nanotubes (MWCNT), the one end of some nanotubes perpendicularly bonded to the heat sink through a chemical process.

Fig. 4 of Dangelo fails show that a coating of gold on both of the die and the heat sink. Uang discloses an IC package comprising at least two die or substrate each having a coating of gold 32, 54 thereon and Fig. 3. Uang further discloses that the each ends of the carbon nanotubes include an amide and/or thiol based linker (organic moieties) to attach the nanotubes to the metal surfaces (col. 2, lines 58-68). It would have been obvious to one of ordinary skill in the art at the time the invention was made

to incorporate the teachings of Uang in order to coat both of the die and the heat sink with gold and tether the nanotubes to the metal surfaces for better conductivity.

The combination of Dangelo/Uang fails to show a first and a second thermal intermediate portions. Fig. 6 of Brown shows nanotubes having two portions 4a, 4b and one end bonded to the die 10' and the other end to the substrate 10. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have two portions of second thermal intermediate portions each bonded to a die and a heat sink with the teachings of Brown to improve heat dissipation.

Note that the device of Dangelo could be a DRAM since Dangelo's device is an IC.

Regarding claims 8-10 and 19-21, Uang discloses that the each ends of the carbon nanotubes include an amide and/or thiol based linker (organic moieties) to attach the nanotubes to the metal surfaces (col. 2, lines 58-68).

Regarding claim 18, Dangelo discloses that a die an IC, therefore, it would be a part of the processor.

Allowable Subject Matter

Claims 22-25 are allowed.

The following is an examiner's statement of reasons for allowance:

Prior art fails to teach or render obvious, either singularly or with combinations of elements as set forth in the claims including a process to make an IC package having a heat sink, at least the limitation of "coating at least one surface of at least one of a heat

sink and of a die with a metal; oxidizing carbon nanotubes ropes in sulfuric and nitric acids, whereby the carbon nanotubes ropes are cut into a plurality of short carbon nanotubes with open ends having carboxyl linkages attached thereto; treating at least one end of at least some of a plurality of carbon nanotubes by applying organic moieties thereto; and tethering one end of the at least some of the carbon nanotubes of the plurality of carbon nanotubes to the metal.”

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Response to Arguments

Applicant's arguments filed 1/9/2008 have been fully considered but they are not persuasive. The rejection of claims 7-11 and 17-21 still stands. And the examiner presents the remarks below in response to Applicant's arguments.

Regarding claim 7, Applicants argue that “Applicants submit that Dangelo teaches away from a feature ‘both an upper surface of the die and a lower surface of the heat sink have metal coatings of gold’ as recited in claims 7 and 17. Dangelo neither shows nor suggests using a gold coating ... Applicants respectfully traverse the Examiner's conclusion that Dangelo does not teach away from using gold as the catalyst material 410. The Examiner's conclusion is erroneous for several reasons. First, the quoted passage from Dangelo recites the a list of choices for the catalyst material in

closed form with an added specification that Ni and Ni alloys are preferred. Gold was not included in that list. Furthermore, the Examiner has not shown that gold could properly be a part of the list of metals for a catalyst layer 410 which meets the specific requirements of Dangelo for the catalyst layer 410. ... Applicants suggest that since a prima facie showing of obvious has not been shown, it is not their burden to show gold cannot be used in catalyst layer 410 of Dangelo to prove that Dangelo teaches away from including gold in the material for layer 410, but rather it remains the Examiner's burden to show that the list of catalyst materials 410 could include gold and still meet the restrictions imposed by Dangelo that its adhesion would be aided by the silicon nitride compounds of layer 412 and that gold would serve as a catalyst to initiate and control growth of the nanotubes in layer 408. While the Office Action concedes that Dangelo fails to show a coating of gold on both of the die and the heat sink as recited in claim 7, it asserts that Uang discloses coating both the die and the heat sink and argues it would be obvious to one of ordinary skill in the art to incorporate such teachings of Uang into Dangelo. Applicants disagree with the conclusory assertion because, as shown above, Dangelo teaches away from using gold as coating material on the heat sink and the die." It is not persuasive. Note that the rejection was made under 35 U.S.C. 103(a) over Dangelo in view of Uang. Dangelo is referred mainly to show an overall structure recited in the instant invention. That is, Dangelo shows a die/IC 402; a heat sink 404, and a thermal intermediate portion 408, a plurality of carbon nanotubes (MWCNT), the one end of some nanotubes perpendicularly bonded to the heat sink through a chemical process. And the Uang reference is introduced to show a die and a

heat sink could be coated with gold. Therefore, it is not persuasive that Uang's teaching cannot be employed to coat the heat sink of Dangelo with gold. In addition, as stated in the previous response, Dangelo merely discloses that preferred material is nickel and Ni alloys. Dangelo does not disclose that a heat sink should not be coated with gold. Therefore, it is speculative that Dangelo teaches away from using gold as the catalyst material.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on **MON.-FRI. 8:30AM-5:00PM**.

Art Unit: 2811

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on (571) 272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lynne A. Gurley/
Supervisory Patent Examiner, Art Unit 2811
/J. M. I./
Examiner, Art Unit 2811